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Host symptom expression and antioxidant defence systems of wheat infected with *Barley yellow dwarf virus* and grown under elevated CO_2

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Abstract

Barley yellow dwarf virus-PAV (BYDV-PAV) is a luteovirus transmitted between plants by phloem-feeding aphids (e.g. the bird-cherry oat aphid, *Rhopalosiphum padi*). BYDV-PAV is associated with yellow dwarf disease in commercial cereals crops (e.g. wheat), often resulting in significant losses of grain yield and quality. Although there has been much study on the effect of predicted future elevated atmospheric CO_2 (eCO_2) on plants, the impact on plant-virus interactions is relatively understudied. The effect of eCO_2 on the growth, physiology and antioxidant defence systems of BYDV-infected wheat may impact the success of different cereal cultivars in the future. In particular, antioxidants ascorbic acid and glutathione are involved in the plant antioxidant defence system that regulates potentially harmful reactive oxygen species (ROS) associated with plant host-virus interactions.

This project compared host symptom expression and antioxidant defence systems of two susceptible (*Triticum aestivum* cv. Yitpi and Revenue) cultivars and a recently released BYDV-resistant (*T. aestivum* cv. Manning) cultivar of Australian wheat, artificially infected with BYDV-PAV using the aphid vector *R.padi*, and grown under eCO_2 in growth chambers and in the field-based Australian Grains Free Air Carbon dioxide Enrichment (AGFACE) facility in Horsham, Victoria, Australia. BYDV-infection was associated with changes in biomass, total antioxidants, and the proportion of oxidised and reduced antioxidants. Data suggests a disruption of plant antioxidant processes with infection, which could lead to greater vulnerability to further biotic

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or abiotic stresses. A comparison of infection under eCO_2 of cultivars with variable susceptibility to plant viruses may provide useful information in selection for future breeding for a changing climate.

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Keywords: Barley yellow dwarf virus; wheat; antioxidants; ascorbic acid; glutathione; reactive oxygen species; elevated CO_2; FACE